

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A virtualization [[controller]] system for controlling data transfer between a host system and a plurality of storage devices, each of the storage devices having a disk controller, a plurality of disk drives, and at least one logical volume relating to a portion of the disk drives, the virtualization [[controller]] system comprising:

a plurality of first ports [[for connection with]] coupled to the plurality of storage devices, ~~each of said storage devices having a storage area to store data;~~

a second port [[for connection with]] coupled to the host system;

a processor; and

a memory configured to store [[volume]] mapping information which correlates first volume identification information used by the host system to access a [[first storage area]] virtual logical volume in [[one of]] the [[storage devices]] virtualization system, with second volume identification information for identifying [[the]] a first [[storage area]] logical volume corresponding to the virtual logical volume and being in a first storage device of the storage devices, the [[correlation]] mapping information being used by the processor to [[access]] transfer data sent from the host system to the first [[storage area]] logical volume; and

wherein, based on [[when]] data stored in the [[storage area]] first logical volume [[has been]] that are transferred to a second [[storage area]] logical volume in [[one]] a second storage device of the storage devices, the [[processor]] memory is configured to store new mapping information which correlates the first volume identification information with [[a]] third volume identification information for identifying the second [[storage area]] logical volume and registers the first identification information and the third identification information in the volume mapping information.

2. (currently amended) The virtualization [[controller]] system as recited in Claim 1, wherein, upon receipt of data [[including]] appended to the first volume identification information, the [[virtualization controller]] processor controls data transfer of the data [[between the host system and]] appended to the first volume identification information to the first [[storage area]] logical volume based on the correlation of volume identification information in the [[volume]] mapping information.

3. (currently amended) The virtualization [[controller]] system as recited in Claim 1, wherein the second volume identification information ~~for identifying the first storage area comprises real~~ includes a port identification of the first storage device containing [[storage area]] the first logical volume and a Logical Unit Number (LUN) identifying [[LUN designating]] the first [[storage area]] logical volume.

4. (currently amended) The virtualization [[controller]] system as recited in Claim [[3]] 1, wherein the second volume identification information ~~for identifying the first storage area comprises~~ includes a personal identification of the first [[storage area]] logical volume contained in the first storage device.

5. (currently amended) The virtualization [[controller]] system as recited in Claim 1,

wherein the memory is configured to store routing information which indicates a relationship of connection among the virtualization [[controller]] system, the storage devices, and the host system;

wherein the processor, upon receipt of data from the host system or any of the storage devices, decides whether to [[give data]] relate identification information [[or not according]] appended to the received data to the volume identification information stored in the [[volume]] mapping information or not, and if ~~the processor decides not to give the~~ [[data]] identification information appended to the received data relates to the volume identification

information, sends the received data to the host system or any of the storage devices according to the routing information.

6. (canceled)

7. (currently amended) The virtualization [[controller]] system as recited in Claim [[6]] 1,

wherein, after [[when]] transfer of data stored in the first [[storage area]] logical volume to the second [[storage area]] logical volume is [[started]] completed, if a request for access to the first [[storage area]] logical volume is received from the host system, ~~the processor holds the access request; and wherein, upon completion of the transfer of data,~~ the processor sends a request corresponding to the [[held access]] request for access to the second storage device having the second [[storage area]] logical volume.

8. (currently amended) The virtualization [[controller]] system as recited in Claim 1, wherein the processor is configured to [[notify]] be sent the mapping information from another [[virtualization controller]] computer system ~~of the volume mapping information~~.

9. (currently amended) The virtualization [[controller]] system as recited in Claim 1, further comprising a third port for connection with a managing unit which is configured to control the virtualization [[controller]] system, wherein the processor is configured to monitor a state of connection with the storage devices connected through the plurality of first ports, and if a change in the connection state is detected, to notify the managing unit of the change in the connection state.

10. (currently amended) A [[data control]] virtualization system [[connected]] coupled to [[one or more]] at least one host systems, ~~the data control system comprising:~~ system and a plurality of storage devices, said storage devices each having a [[storage area; and]] plurality of disk drives and at least one logical volume related to a portion of the disk drive, the virtualization system comprising:

a switch which is connected with the plurality of storage devices and the one or more host systems, the switch including:

a plurality of first ports [[for connection with]] coupled to the storage devices;

[[one or more]] at least one second [[ports for connection with]] port coupled to the [[one or more]] host [[systems]] system; and

a memory configured to store information on a correlation between first identification information used by the host system to access a first storage area of one of the storage devices, and second identification information for identifying the first storage area; and

a [[routing]] first processor configured to convert data with the first volume identification information, which is added to data received from the host system and is used to identify a virtual logical volume of the virtualization system, into [[data with]] the second volume identification information for identifying a first logical volume in a first storage device of the storage devices according to relationship information between the first volume identification information and the second volume identification information and to send [[the converted]] data added the second volume identification information to the first storage device having the first storage area according to the correlation information;

wherein, after [[when]] data stored in the first [[storage area]] logical volume has been transferred to a second [[storage area]] logical volume of [[one]] a second storage device of the storage devices, the [[routing]] first processor [[converts data with]] is configured to convert the first volume identification information, which is added to another data received from the host system, into third volume identification information for identifying the second logical volume according to new relationship information between the first volume identification information [[into data with]] and the third volume identification information for identifying the second storage area and sends the converted data to the storage device having the second storage area and to send data added the third volume identification information to the second storage device.

11. (currently amended) The [[data control]] virtualization system as recited in Claim 10, wherein the second volume identification information for identifying the first storage area comprises real includes a port identification of the first storage device containing

first [[storage area]] logical volume and [[LUN designating]] a Logical Unite Number (LUN) identifying the first [[storage area]] logical volume.

12. (currently amended) The [[data control]] virtualization system as recited in Claim 10, further comprising:

~~wherein the switch further comprises a data transfer~~ a second processor which controls the process of transferring data stored in a ~~storage area of one of the storage devices to another storage area of one of the storage devices~~ third logical volume corresponding to another virtual logical volume to a fourth logical volume, and

~~wherein when data stored in the first storage area is transferred to the second storage area, the data transfer~~ the second processor correlates [[the first]] fourth volume identification information, which is used to identify the third logical volume, with the [[third]] fifth volume identification information ~~and registers and stores the correlation information in the memory for identifying the fourth logical volume according to relationship information between the fourth volume identification information and the fifth volume identification information.~~

13. (canceled)

14. (currently amended) The [[data control]] virtualization system as recited in Claim [[12]] 10, further comprising at least one third port coupled to a managing unit [[connected with the switch]], wherein the managing unit ~~has a volume manager which is configured to send the [[correlation]] relationship information to the switch and to set the correlation information for the switch~~ virtualization system.

15. (currently amended) The [[data control]] virtualization system as recited in Claim [[12]] 10,

wherein when transfer of data stored in the first [[storage area]] logical volume to the second [[storage area]] logical volume is started, if a request for access to the first [[storage area]] logical volume is received from the host system, the [[routing]] first processor [[holds]] configured to hold the access request; and

wherein, upon completion of the transfer of data, the [[routing]] first processor
[[sends]] controls to send the held access request to the second storage device having the second
[[storage area]] logical volume.

16. (currently amended) A method of controlling data transfer in a
virtualization system [[including]] coupled to a host system which uses first volume
identification information to access a [[first storage area]] virtual logical volume ~~in one of a~~
~~plurality of storage devices~~ the virtualization system, and a plurality of storage devices, which
each has a plurality of disk drives and a logical volume related to a portion of the disk drives,
~~wherein the first storage area includes data associated with second identification information~~
~~identifying the first storage area,~~ the method comprising:

correlating first volume identification information for identifying the virtual
logical volume with second volume identification information for identifying a first logical
volume in a first storage device of the storage devices;

[[issuing a]] receiving data transfer request to the first storage device to transfer
the data with the second identification information in the first storage device stored in a first
logical volume;

transferring the data stored in the first logical volume to a second logical volume
in a second storage device of the plurality of storage devices; and

~~based upon receipt of notification of completion of data transfer from~~ transferring
the data stored in the first logical volume [[the first storage device]] to the second logical volume
[[the second storage device]], correlating the first volume identification information with [[a]]
third volume identification information for identifying the second [[storage area]] logical volume
[[containing the transferred data]].

17. (currently amended) The method of controlling data transfer as recited in
Claim 16, further comprising:

registering the first volume identification information and the third volume identification information in ~~[[a volume]] mapping information and storing the volume mapping information in a memory; [[and]]~~

receiving a data input/output request, sent from the host system, and targeted to the virtual logical volume;

converting ~~[[the data with]]~~ the first volume identification information included in the data input/output request into ~~transferred from the first storage device into data with~~ the third volume identification information; and

transferred to the second storage device transferring the converted data input/output request to the second logical volume after correlating the first volume identification information with the third volume identification information.

18. (currently amended) The method of controlling data transfer as recited in Claim 16, further comprising:

~~[[holding]] receiving an access request, which is sent from the host system and is targeted to the virtual logical volume to the first storage device after issuance of the data transfer request; and~~

based upon transferring the data stored in the first logical volume to the second logical volume, sending the [[held]] access request to the second storage device after receipt of notification of completion of the data transfer logical volume after correlating the first volume identification information with the third volume identification information.

19. (currently amended) A method of connecting a virtualization ~~[[controller between]]~~ system, which couples to a host system and a first storage device ~~which are connected through a first path between a first port of the host system and a first port of the storage device and a second path between a second port of the host system and a second port of the storage device and has a virtual logical volume corresponding to a first logical volume related to a portion of a plurality of disk drives in the first storage device,~~ the method comprising:

accessing a storage area of the storage device;

~~disconnecting the second path between the second port of the host system and the second port of the storage device;~~

~~connecting the second port of the host system with the virtualization controller through a third path;~~

~~transferring data sent from the host system to the first logical volume by changing first volume identification information, which is appended to the data sent from the host system and is used to identify the virtual logical volume, into second volume identification information for identifying the first logical volume;~~

~~connecting the virtualization [[controller]] system with the second [[port of the]] storage device through a [[fourth]] path; [[and]]~~

~~setting, on the virtualization [[controller]] system, the first volume identification information used by the host system to identify the storage area, and third volume identification information for [[the]] identifying a second [[port of]] logical volume related to a portion of a plurality of disk drives in the second storage device, and virtual port identification information for the virtualization controller, which are [[correlated to define]] used to access [[of]] the [[storage area]] second logical volume by the host system; and~~

~~transferring another data sent from the host system to the second logical volume by changing the first volume identification information, which is appended to the another data sent from the host system, into third volume identification information after setting the first volume identification information and third volume identification information.~~

20. (currently amended) The method as recited in Claim 19, further comprising:

~~sending, from the virtualization controller to the host system, the identification information used by the host computer to identify the storage area, and the virtual port identification information;~~

sending, from the host system to the virtualization [[controller]] system, an access request to access the [[storage area]] virtual logical volume using [[the]] virtual port

identification information of the virtualization system ~~through the second port of the host system;~~
and

upon receipt of the access request from the host system, accessing the storage area
~~via the fourth path by~~ second logical volume the virtualization [[controller]] system.

21. (currently amended) The method as recited in Claim [[20]] 19, wherein the access request comprises data with the first volume identification information and virtual port identification information of the virtualization system, and wherein [[accessing]] transferring to the [[storage area]] second logical volume comprises sending the data associated with the third volume identification information and the virtual port identification information from the virtualization [[controller]] system to the [[storage area]] second logical volume via the [[fourth]] path.

22. (currently amended) The method as recited in Claim 19, wherein the first volume identification information ~~used by the host system to identify the storage area~~ comprises personal information of the [[storage area]] virtual logical volume.

23. (currently amended) The method as recited in Claim 19, wherein the first volume identification information ~~for the second port of the storage device and the~~ and virtual port identification information for the virtualization [[controller]] system are both ~~correlated with the identification used by the host system used~~ to identify the storage area ~~to define an access path from the host system to the storage area~~ virtual logical volume.

24. (currently amended) A method of controlling data transfer [[in]] by a virtualization system [[including]] coupled to a host system which uses first volume identification information to access a [[first storage area]] virtual logical volume [[in one]] of the virtualization system, and a plurality of storage devices, ~~wherein the first storage area includes data associated with second identification information identifying the first storage area, which~~ each has a plurality of disk drives and a logical volume related to a portion of the disk drives, the method comprising:

receiving a first request with [[the]] a first ~~volume~~ identification information, which is used to identify the virtual logical volume, from the host system to access the data associated with the second identification information identifying the first storage area;

sending a second request with ~~[[the]] a second ~~volume~~ identification information, which is used to identify a first logical volume in a first storage device of the storage devices and relates to the first volume identification information of the first request, to the first ~~[[storage area]] logical volume by using relationship between the first volume identification information and the second volume identification information;~~~~

receiving data corresponding to the second request from the first ~~[[storage area]] storage device; ~~[[and]]~~~~

sending the received data to the host system;

after transferring data stored in the first logical volume to a second logical volume in a second storage device of the storage devices, receiving a third request with the first volume identification information from the host system;

sending a fourth request with a third volume identification information, which is used to identify the second logical volume and relates to the first volume identification information of the first request, to the second logical volume by using new relationship between the first volume identification information and the third volume identification information;

receiving another data corresponding to the fourth request from the second storage device; and

sending the received another data to the host system.

25. (currently amended) The method of controlling data transfer as recited in Claim 24, [[further comprising:]] wherein the step of transferring data stored in the first logical volume to the second logical volume comprises:

receiving from a managing unit a command of data transfer from the first ~~[[storage area]] logical volume to ~~[[a]] the second ~~[[storage area]] logical volume in one of the plurality of storage devices;~~~~~~

sending an access request to the first [[storage area]] logical volume based on receiving the command with the second identification information;
receiving data corresponding to the access request from the first [[storage area]] logical volume;
sending the received data to the second [[storage area]] logical volume;
~~correlating the first identification information with a third identification information for identifying the second storage area to produce correlation information, and registering and storing the correlation information.~~
storing the new relationship information.

26. (currently amended) The method of controlling data transfer as recited in Claim [[25]] 24, further comprising:

storing the new relationship information based on transferring data stored in the first logical volume to the second logical volume.
~~receiving a third request with the first identification information from the host system, the first identification information being correlated with the third identification information based on the stored correlation information;~~
sending a fourth request with the third identification information to the second storage area;
receiving data corresponding to the fourth request from the second storage area;
and
sending the received data to the host system.

27. (new) The virtualization system as recited in Claim 1, wherein the first logical volume corresponds to a first port of the first storage device, and the second logical volume corresponds to a second port of the second storage device.

28. (new) The virtualization system as recited in Claim 1,

wherein the mapping information correlates first port identification information of a first port of the virtualization system, used by the host system to access the virtual logical volume, with second port identification information for identifying a second port of the first storage device, and

wherein, based on the data stored in the first logical volume that are transferred to the second logical volume the processor correlates the first port identification information with a third port identification information for identifying a third port of the second storage device, and registers the third port identification information correlated with the first port identification information in the mapping information.

29. (new) The virtualization system as recited in Claim 10, wherein the first logical volume corresponds to a first port of the first storage device, and the second logical volume corresponds to a second port of the second storage device.

30. (new) The virtualization system as recited in Claim 10, wherein the relationship information is further correlated first port identification information of a first port of the virtualization system, used by the host system to access the virtual logical volume, with second port identification information for identifying a second port of the first storage device, and

wherein, if the data stored in the first logical volume are transferred to the second logical volume, the new relationship information is correlated the first port identification information with a third port identification information for identifying a third port of the second storage device.

31. (new) The method of controlling data transfer as recited in Claim 16, wherein the first logical volume corresponds to a first port of the first storage device, and the second logical volume corresponds to a second port of the second storage device.

32. (new) The method of controlling data transfer as recited in Claim 16, further comprising:

correlating first port identification information of a first port of the virtualization system, used by the host system to access the virtual logical volume, with second port identification information for identifying a second port of the first storage device, and

based upon transferring the data stored in the first logical volume to the second logical volume, correlating the first port identification information with a third port identification information for identifying a third port of the second storage device.

33. (new) The virtualization system as recited in Claim 1, wherein the first volume identification information includes a virtual port identification information and a Logical Unit Number (LUN) identifying the virtual logical volume.

34. (new) The virtualization system as recited in Claim 1, further comprising: the virtualization system including a switch having the first ports, the second port, the processor and the memory.

35. (new) The virtualization system as recited in Claim 1, further comprising: a processing circuit configured to convert the first volume identification information, which is appended to data received from the host system, into the third volume identification information according to the new mapping information and to send data appended the third volume identification information to the second storage device.

36. (new) The virtualization system as recited in Claim 1, further comprising: a processing circuit configured to convert the first volume identification information, which is appended to another data received from the host system, into the third volume identification information according to the new mapping information and to send data appended the third volume identification information to the second storage device

another processing circuit configured to convert fourth volume identification information, which is appended to data received from the host system and is used to identify another virtual logical volume of the virtualization system, into fifth volume identification information for identifying a third logical volume in a third storage device of the storage devices

according to mapping information between the fourth volume identification information and the fifth volume identification information and to send data appended the fifth volume identification information to the third storage device.

37. (new) The virtualization system as recited in Claim 10, wherein the first volume identification information includes a virtual port identification information and a Logical Unit Number (LUN) identifying the virtual logical volume.

38. (new) The virtualization system as recited in Claim 10, further comprising:

the virtualization system including a switch having the first ports, the second port and the processor.

39. (new) The virtualization system as recited in Claim 10, further comprising:

a second processor configured to convert fourth volume identification information, which is added to data received from the host system and is used to identify another virtual logical volume of the virtualization system, into fifth volume identification information for identifying a third logical volume in a third storage device of the storage devices according to relationship information between the fourth volume identification information and the fifth volume identification information and to send data added the fifth volume identification information to the third storage device.

40. (new) The method of controlling data transfer as recited in Claim 16, wherein the first volume identification information includes a virtual port identification information and a Logical Unit Number (LUN) identifying the virtual logical volume.

41. (new) The method of controlling data transfer as recited in Claim 16, wherein:

the virtualization system is a switch.

42. (new) The method of controlling data transfer as recited in Claim 16, wherein:

receiving, by a first processing circuit in the virtualization system, a first data input/output request, which is sent from the host system and is targeted to the virtual logical volume;

converting, by the first processing circuit, the first volume identification information included in the first data input/output request into the third volume identification information;

transferring, by the first processing circuit, the converted first data input/output request to the second logical volume after correlating the first volume identification information with the third volume identification information;

receiving, by a second processing circuit in the virtualization system, a second data input/output request, which is sent from the host system or another host system and is targeted to another virtual logical volume;

converting, by the second processing circuit, a fourth volume identification information, which is used to identify the another virtual logical volume and is included in the second data input/output request, into a fifth volume identification information for identifying a fourth logical volume in a third storage device of the storage devices;

transferring, by the second processing circuit, the converted second data input/output request to the fourth logical volume.

43. (new) The method as recited in Claim 19, wherein the first volume identification information includes a virtual port identification information and a Logical Unit Number (LUN) identifying the virtual logical volume.

44. (new) The method as recited in Claim 19, wherein:
the virtualization system is a switch.

45. (new) The method as recited in Claim 19, wherein:

receiving, by a first processing circuit in the virtualization system, a first data input/output request, which is sent from the host system and is targeted to the virtual logical volume;

changing, by the first processing circuit, the first volume identification information included in the first data input/output request into the third volume identification information;

transferring, by the first processing circuit, the changed first data input/output request to the second logical volume after setting the first volume identification information and the third volume identification information;

receiving, by a second processing circuit in the virtualization system, a second data input/output request, which is sent from the host system or another host system and is targeted to another virtual logical volume;

changing, by the second processing circuit, a fourth volume identification information, which is used to identify the another virtual logical volume and is included in the second data input/output request, into a fifth volume identification information for identifying a fourth logical volume in a third storage device;

transferring, by the second processing circuit, the changed second data input/output request to the fourth logical volume.

46 (new) The method of controlling data transfer as recited in Claim 24, wherein the first volume identification information includes a virtual port identification information and a Logical Unit Number (LUN) identifying the virtual logical volume.

47. (new) The method as recited in Claim 24, wherein:
the virtualization system is a switch.

48. (new) The method as recited in Claim 24, wherein:

receiving, by a first processing circuit in the virtualization system, a first data input/output request, which is sent from the host system and is targeted to the virtual logical volume;

changing, by the first processing circuit, the first volume identification information included in the first data input/output request into the third volume identification information;

transferring, by the first processing circuit, the changed first data input/output request to the second logical volume based on the new relationship information;

receiving, by a second processing circuit in the virtualization system, a second data input/output request, which is sent from the host system or another host system and is targeted to another virtual logical volume;

changing, by the second processing circuit, a fourth volume identification information, which is used to identify the another virtual logical volume and is included in the second data input/output request, into a fifth volume identification information for identifying a fourth logical volume in a third storage device;

transferring, by the second processing circuit, the changed second data input/output request to the fourth logical volume.